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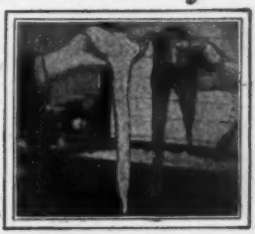

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STUDIES ON THE LIVING BLOOD CELLS OF THE NEWBORN[1]

CLAUDE E. FORKNER, M.D.

From the Thorndike Memorial Laboratory and Pediatric Service of the Boston City Hospital and Department of Pediatrics of the Harvard Medical School

The studies here reported were suggested to me by Dr. Thomas E. Buckman and were carried out at the Boston City Hospital. The purpose of these studies was to observe living blood cells of the newborn and to follow the fluctuations of the formed elements of the blood, the hemoglobin, and the serum proteins during the first twelve days of extrauterine life. At this period of life one often encounters, in the blood, cells which are difficult to recognize and classify by the usual methods of fixation and staining. It was thought that the supravital method of studying living cells with vital dyes might give additional criteria which would make these cells more easily recognizable.

There have been many studies on the morphology of the blood of normal infants, particularly with regard to the numbers of white blood cells and red blood cells in the circulating blood at birth and during the subsequent few days. Adequate reviews of the literature on this subject have been made by Lippman (1) and more recently by Stransky (2). Consequently no attempt will be made to give a complete bibliography here, but reference will be made to some of the more important papers which bear directly on data presented in this communication. All of the studies reported in the literature concerning the morphology of the leucocytes of the normal, newborn infant have been carried out by observations on fixed films of blood cells. The observations here reported were made with the aid of one of the newer methods of hematological research—that of studying living cells supravitally stained with neutral red and Janus green.

MATERIALS AND METHODS

Care was taken to determine that the infants chosen for study were normal. The weights at birth varied from 6½ to 10 pounds. They

[1] Received for publication March 1, 1929.

were all full-term babies, and all normal deliveries, except one, which was delivered at term by Caesarian section. Fifteen cases were studied and three to five examinations of the blood were made over a period of twelve days.

The blood was taken from the heel[2] by puncture with a small lancet. Care was exercised to obtain a freely flowing sample. The first drop was not used. Examinations were made of the hemoglobin, total red cells, reticulated red cells, total and differential counts of the white blood cells, total blood platelets, and in some cases serum proteins. Standardized pipettes and chambers were used in all counts. Coverslip smears were made and stained by Wright's method in each case and the findings correlated with the supravital studies.

The first use of the supravital method of staining blood cells has been ascribed to Rosin and Bibergeil (3), although it has also been accredited to Pappenheim (4). In recent years there has been a revival of interest in the study of fresh tissues, both from the standpoint of normal histology and of pathology. The stimulus for this revival lies largely in the researches of Prof. H. M. Evans and Dr. Florence Sabin. It was through their work and that of their pupils that we first began to understand the relation between chemical constitution, physical properties, and the ability of dyes to behave as vital stains. Simpson (5, 6), while working in Evans' laboratory in 1921, published two papers in which she described the method used by her to study supravitally, with neutral red and Janus green, the blood of human cases and of laboratory animals. Sabin (7), Lucas and Hoobler (8), and others have more recently used the supravital method extensively.

The glassware must be carefully cleaned[3] to avoid the presence of

[2] Some question has arisen as to the relative value of blood cell counts taken from the heel, as compared with blood taken from other sources. Lucas (14), in a series of investigations in which he compared the blood cell counts of the peripheral blood and of blood from the longitudinal sinus, has shown that there are no significant differences.

[3] Slides and coverslips may be satisfactorily cleaned as follows: (*a*) wash in soap and water; (*b*) rinse in tap water; (*c*) immerse one at a time in concentrated sulphuric acid, to which potassium bichromate crystals have been added, and allow to stand overnight or for several days; (*d*) rinse carefully and let stand in running water for several hours; (*e*) rinse in distilled water; (*f*) transfer to 95 per cent alcohol; (*g*) wipe off slides and coverslips with a clean unstarched cloth.

any chemical agents which would injure the cells, and to insure an even distribution of the blood film. For these studies stock solutions of 0.5 per cent neutral red and 0.1 per cent Janus green were made up in 95 per cent alcohol. These dyes were used because it has been shown by Evans and Scott (9), by Simpson (5, 6), and by Sabin (7) that they are excellent agents for demonstrating specific granules, segregation apparatus and mitochondria, with a minimum of damage to the cells. The dyes were used as a mixture of about five parts of the neutral red stock solution to four parts of the Janus green stock solution. These solutions and concentrations may be employed as a working basis, although it may be necessary to vary them somewhat with different samples of the dye. I have used Gruebler neutral red and Metz Janus green. The mixture of the two dyes is not a stable preparation and should be made on the same day that films of the dye are to be placed on the slides. The end of a slide having perfectly ground edges is immersed in the dye mixture and a smear is then made over another slide which has been previously warmed. The slide dries immediately, leaving a thin and even film which should be light enough to be barely perceptible on a white background. If the concentration is too great, the cells will be overstained and killed. Nuclear staining is an accepted evidence of cell death. Many slides may be prepared in this way for future use, but better results will be obtained if they are not kept for more than two weeks.

After the above procedure has been carried out, both the stained slide and a clean coverslip are brushed with a camel's hair brush. A drop of blood of the proper dimensions is secured on the coverslip and the latter is allowed to fall on the stained surface of the slide. The blood spreads out of its own accord, and if the drop is of the proper size, it will spread evenly, barely reaching the edges of the coverslip. The preparation is quickly rimmed with vaseline or melted paraffin, care being taken not to move or exert pressure on the coverslip. It is easy to make reticulated red blood cell counts in precisely the same manner, using brilliant cresyl blue instead of neutral red, for this dye seems to show the reticulation better. A saturated alcoholic solution of brilliant cresyl blue may be applied to one end of a slide and the mixture of neutral red and Janus green to the other. I have used this method constantly. In this way a reticulated red blood cell count

and a differential white blood cell count may be made by using two coverslips on the same slide.

It is advisable to begin the study at once, for the cells take up the dye within a few minutes. The length of time during which a preparation may still be studied varies with the concentration of the dye and with the temperature. If the preparation is observed in a warm box and with the proper dye concentration, it may last for one or two hours.

The advantages of the supravital method over the fixed preparation method of studying and counting blood cells are many. In the first place, a more normal state of the tissue is approached and living and functioning cells are observed rather than dead ones. Obviously this is certain to lead to a better understanding of the physiology of both normal and abnormal forms. Any method which enables us to study living structure in its direct relation to function should prove an important adjunct to the study of structure of dead and fixed tissue isolated from its physiological environment. A second factor which recommends this method is the fact that there is little or no mechanical or chemical injury to the cells. With the ordinary fixed smear we are constantly annoyed by finding cells about which little can be stated because their cytoplasmic membranes have been ruptured and the whole structure is often distorted. This is necessarily true because of the rigorous measures employed in smearing, drying, and fixing the cells. These objections are largely eliminated by the technique here used.

The white blood cells have been grouped into five main classes: polymorphonuclear neutrophils, polymorphonuclear basophils, polymorphonuclear eosinophils, monocytes, and lymphocytes. It did not seem advisable to sub-divide the lymphocytes into large, medium, and small sizes. The monocytes were not sub-divided into the so-called transitional and large mononuclear types.

OBSERVATIONS AND RESULTS

Total white blood cells. It has been known since the work of Bayer (10), nearly fifty years ago, that there is a leucocytosis in the newborn, but it has been only within the last few years that the high white blood cell count has been subjected to critical analysis. The character of

the curves of the total white blood cell count during the first few days of life, I have found to be essentially the same as that reported by Schiff (11), Von Reuss (12), Gundobin (13), Lucas, Dearing, Hoobler, Cox, Jones, and Smyth (14), and Lippman (1). On the first day of extrauterine life a considerable variation in the number of total white cells was found in the infants I studied. They ranged from 15,250

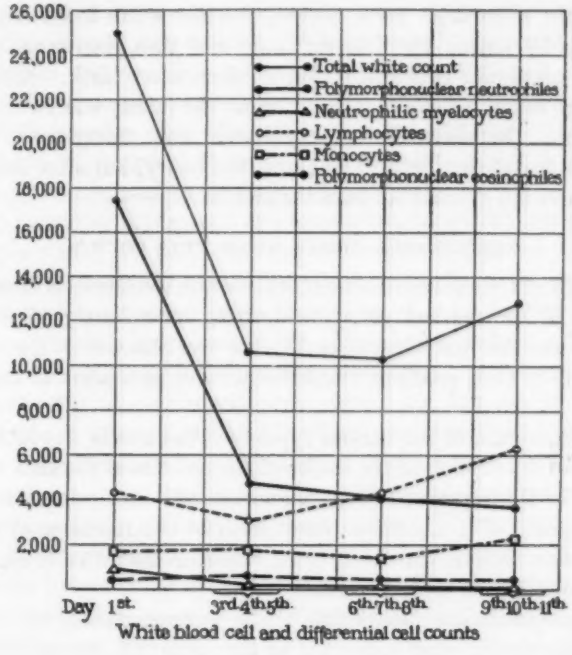

FIG. 1

to 45,000 cells per cubic millimeter, with an average in 13 cases of 24,945. There was only 1 case which showed a count as high as 45,000, two between 30,000 and 35,000, one 25,000 to 30,000, five 20,000 to 25,000, and four with counts of 15,000 to 20,000 white blood cells per cubic millimeter. The curve (Fig. 1) shows the average results obtained. In every case there was an immediate decrease in

the total white blood cell count after the first day. Following this more or less precipitous fall, there was a more gradual decrease which persisted until the sixth or eighth day of life, forming a low level around 10,000 cells per cubic millimeter. After the first week of extrauterine life, there was a gradual increase to about 13,000 cells per cubic millimeter on the tenth day.

An intensive study by Lippman (1) of the blood during the first forty-eight hours after birth showed that the white blood cell count rises rapidly during the first six hours and then rises more slowly, until a maximum is reached twelve hours after birth. After this period he found a definite descent, until the infant was twenty-four hours old. Between the twenty-fourth and thirty-sixth hours, Lippman found the count to be about stationary, but after thirty-six hours there is a gradual fall until the fifth day.

DIFFERENTIAL WHITE BLOOD CELL COUNTS

A study of the differential count of the white blood cells is interesting because of the marked changes occurring immediately after birth. Table I and the first chart (Fig. 1) show the behavior of the various cell types in their relations to each other and in relation to the total counts.

In a discussion of the various types of cells there is also included a very brief description of the major characteristics of the cells as they appear in the supravital preparations stained with neutral red and Janus green. For a detailed description of the reactions of human blood when stained with basic dyes, reference should be made to the papers of Simpson (5, 6) and Sabin (7).

Polymorphonuclear neutrophils. The polymorphonuclear neutrophilic leucocytes, when subjected to the supravital staining method, are distinguished chiefly by two characteristics. The specific granules which fill the cytoplasm almost completely are very faintly stained with neutral red; they are even-sized, refractive, almost colorless, and are easily distinguished from the cytoplasmic structures of all other cells. The second important characteristic of these cells is their striking motility. There is no question but that these are the most motile cells in the circulation and it is characteristic to see the clear cytoplasmic pseudopods wander out from the cell body and then

observe the specific granules stream out toward the new position. The nucleus follows more or less passively. The term "segregation apparatus" was given by Evans and Scott (9) to certain cytoplasmic structures which are largely, but not exclusively preformed, and which attract and concentrate dyes in a special set of granules and vacuoles in certain cells. The majority of cells of the neutrophilic series do not contain a demonstrable "segregation apparatus," but it is not infrequent that a few segregation bodies can be made out, and in some cases they become very striking. When present in the neutrophils, the segregation granules stain a brownish red color and vary greatly in size. Mitochondria do not constitute a dominant feature of these cells, but are more easily demonstrated in the neutrophils than in the other cells of the myeloid series. They present a picture of bluish green dots, rods, and filaments in the cytoplasm.

The results of differential and total white blood cell counts in the newborn during the first four days of life showed that the changes in the total counts were caused largely by changes in the number of neutrophilic leucocytes (Table I and Fig. 1). At the end of seven days, and again after the tenth day, it was found that the neutrophils tended to remain more or less constant (Fig. 2).

Neutrophilic myelocytes were seen during the first day in all cases except one and formed from 0.5 to 10 per cent (average 3.88 per cent) of the white blood cells. They were of the late type, the cytoplasm being well-filled with specific granules. These cells are usually slightly larger than polymorphonuclear neutrophils. The specific granules stain slightly more than those of the adult neutrophils and have a yellowish brown tinge in supravital films. The granules are often clustered about a clear area, the centrosphere of the cell. These myelocytes are non-motile. The nuclei are round or somewhat indented. They have a delicate chromatin network. Myelocytes remained present in four of 9 cases on the fourth day, varying from 0.5 to 1.5 per cent (average 1.25 per cent). On the seventh day they were present in three-fifths of the cases, varying from 0.5 to 3.0 per cent (average 1.5 per cent). These cells were present on the tenth day in less than one-third of the cases, varying from 0.5 to 1 per cent (average 0.66 per cent). The average total numbers showed a gradual decline from 800 cells per cubic millimeter on the first day to 24 cells

TABLE I

Formed elements of the blood, serum proteins, and hemoglobin of the newborn

CASE NUMBER	DAYS AFTER BIRTH	WEIGHT	SERUM PROTEIN	HEMOGLOBIN	TOTAL RED CELLS	RETICULATED REDS	NUCLEATED REDS	TOTAL PLATELETS	TOTAL WHITE BLOOD CELLS	POLYMORPHONUCLEAR						MONOCYTES		LYMPHOCYTES		NEUTROPHILIC MYELOCYTES		UNCLASSIFIED	
										Neutrophiles		Mast cells		Eosinophiles									
										Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute	Per cent	Absolute
		pounds		*per cent*		*per cent*																	
1	1	6.87			6,554,000	0.2		344,000	22,315	69.0	15,397			1.0	223	10.0	2,231	13.0	2,901	7.0	1,562		
2	1	7.87		151.5	5,080,000	0.6		192,000	31,150	61.0	19,000	0.5	155	1.5	467	6.5	2,024	28.0	8,722	2.0	623	0.5	155
3	1	7.00		150.0	6,992,000	1.0	+	632,000	21,350	72.0	15,372	1.5	320	0.5	106	4.5	960	19.0	4,056	2.0	427	0.5	106
4	1	7.50		129.0	5,520,000	3.0	+	488,000	15,250	74.5	11,361	0.5	76	0.5	76	5.5	838	16.5	2,516	2.5	381		
5	1	7.69		129.0	6,872,000	2.8	+	576,000	45,000	74.5	33,525			0.5	225	11.5	5,175	12.5	5,625	1.0	450		
6	1	6.87	6.68	156.0	6,112,000	2.0		328,000	26,800	74.5	19,966			0.5	134	7.0	1,876	12.5	3,350	5.5	1,474		
7	1	8.13	7.43	105.0	4,632,000	2.3		424,000	16,280	53.0	8,628	0.5	81	5.5	895	5.0	814	36.0	5,860				
8	1	9.00	6.11	120.0	5,824,000	2.8		212,000	17,840	56.0	10,000	1.5	267	3.0	535	5.0	892	24.5	4,370	10.0	1,784		
9	1	8.00	7.03	172.5	5,920,000	3.9	+	304,000	35,760	82.5	29,500					4.5	1,609	10.5	3,755	2.0	715	0.5	178
10	1	10.00		148.5	5,280,000	0.3		384,000	22,200	70.0	15,540	1.0	222	3.0	666	9.0	2,000	9.0	2,000	7.0	1,554	1.0	222
11	1	8.06		184.5	6,288,000	0.5		192,000	31,800	64.0	20,352	2.0	636	2.0	636	4.0	1,272	22.0	7,000	6.0	1,908		
12	1	6.5		138.0	6,768,000	1.4		272,000	15,350	60.5	9,287			6.0	921	9.0	1,381	24.0	3,684	0.5	77		
13	1	7.5	7.48	190.5	5,680,000	4.1	+	208,000	23,200	82.0	19,024			3.0	696	3.0	696	11.0	2,552	1.0	232		
Average 1st day...		7.77	6.95	148.5	5,963,230	1.91		350,461	24,945	68.73	17,457	0.58	135	2.08	429	6.50	1,674	18.34	4,338	3.57	860	0.2	50
1	4	6.41		142.5	5,500,000	0.8			18,800	54.0	10,152			2.0	376	23.0	4,324	20.0	3,760			1.0	188
2	4	7.25		187.5	4,408,000	1.0		168,000	4,000	45.0	1,800			13.0	520	23.0	920	15.0	600			4.0	160
3	5	6.56		142.5	7,008,000	0.2		368,000	7,350	38.5	2,829	0.5	37	6.5	477	16.5	1,213	38.0	2,793			0.5	37
6	3	6.62		156.0	4,960,000	0.9		240,000	11,200	59.0	6,608			1.5	168	19.5	2,184	18.5	2,072	1.5	168		
14	4	7.75		117.0	4,552,000	1.8		168,000	11,100	32.5	3,608	0.5	55	11.0	1,110	16.0	1,776	39.5	4,385	0.5	55		
7	5	7.69	6.86	150.0	4,344,000	1.2		616,000	11,650	32.0	3,728			5.5	640	16.5	1,922	44.5	5,184	1.5	174		
8	4	9.25	6.05	154.5	6,584,000	0.8		496,000	9,450	54.5	5,150			4.0	378	10.0	945	30.0	2,835	1.5	141		
9	3	8.00	7.37	165.0	6,184,000	2.3		248,000	12,650	56.9	7,197	1.7	215	8.4	1,062	10.9	1,375	20.9	2,644			1.2	152
9	5	8.03	7.61	165.0	5,936,000	2.0		224,000	9,520	34.5	3,284	2.0	190	7.0	666	16.5	1,570	40.0	3,808				
Average 3rd, 4th and 5th days...		8.51	6.97	153.0	5,497,330	1.2		316,000	10,636	45.2	4,927	0.52	59	6.54	600	16.88	1,803	29.6	3,120	0.55	60	0.74	60

2	8	7.31		142.5	4,664,000	0.4		312,000	14,550	33.0	4,801			5.0	727	14.0	2,037	45.0	6,548	3.0	437		
3	7	6.56		142.5	6,888,000	0.2		328,000	7,600	67.0	5,092			5.0	380	10.0	760	17.0	1,292	1.0	76		
4	6	7.13		124.5	4,656,000	0.6		360,000	8,050	41.0	3,300			2.0	160	17.5	1,408	38.5	3,099			1.0	80
5	6	7.31		130.5	6,560,000	0.6		160,000	9,450	46.0	4,347	1.5	142	4.5	425	18.0	1,700	26.5	2,504	2.5	236	1.0	95
6	7	6.38		142.5	5,872,000	0.6		448,000	8,600	33.5	2,881			7.0	602	19.5	1,677	38.5	3,311	1.0	86	0.5	43
14	8	8.00		117.0	4,672,000	0.8		424,000	11,800	35.5	4,190			2.5	295	10.0	1,180	51.0	6,018	1.0	118		
15	6	7.06	7.78	136.5	5,480,000	1.0		288,000	8,200	26.5	2,173	1.5	123	2.0	164	14.0	1,148	56.0	4,592				
7	8	8.06	6.86	150.0	4,488,000	1.0		428,000	11,500	30.0	3,450	0.5	57	1.5	172	7.0	805	61.0	7,015				
8	7	9.63		160.5	5,928,000	0.7		224,000	7,700	28.0	2,156			6.0	462	18.5	1,424	46.0	3,540	0.5	39	1.0	77
9	7	8.00	7.37	165.0	6,608,000	1.1		440,000	16,400	52.0	8,528	1.2	196	4.4	721	14.4	2,362	28.0	4,592				
Average 6th, 7th and 8th days...		7.54	7.34	141.0	5,581,000	0.6		341,200	10,385	39.25	4,094	0.47	52	3.99	411	14.29	1,450	40.75	4,251	0.99	103	0.35	29
1	9	7.44		127.5	4,992,000	0.4		256,000	13,350	46.0	6,141	1.0	134	2.0	267	28.0	3,738	22.0	2,937			1.0	134
1	11	7.56		142.5	5,696,000	0.1		176,000	14,050	37.0	5,199			3.0	421	26.0	3,653	34.0	4,777				
2	11	7.13		150.0	4,360,000	0.2		288,000	16,500	34.5	5,692	1.0	165	2.0	330	16.5	2,722	46.0	7,590				
4	10	7.06		115.5	4,448,000	0.8	+	288,000	10,250	25.5	2,614			3.5	358	15.0	1,537	55.0	5,637	1.0	102		
5	10	7.19		126.0	5,800,000	0.2		248,000	14,850	24.5	3,638			1.5	223	18.0	2,673	56.0	8,316				
6	10	6.75	8.07	138.0	5,312,000	0.6		224,000	11,450	32.5	3,721	1.5	171	5.5	629	13.0	1,489	47.0	5,382			0.5	57
15	10	7.25	7.96	120.0	5,432,000	0.3		336,000	13,700	20.5	2,808			1.5	205	8.5	1,164	69.0	9,453	0.5	69		
7	10	7.81	7.37	142.5	5,248,000	0.7		584,000	12,520	18.5	2,316			3.5	438	13.0	1,627	60.5	7,574			4.5	563
8	9	9.69	7.03	153.0	5,616,000	0.8	+	272,000	8,100	24.4	1,976	0.4	32	5.2	421	15.0	1,215	55.0	4,455				
9	10	8.13	7.84	160.5	5,624,000	1.2		304,000	13,440	26.0	3,494	2.0	269	6.5	873	18.0	2,419	47.0	6,317	0.5	67		
Average 9th, 10th and 11th days..		7.60	7.65	138.0	5,252,800	0.53		297,600	12,821	28.94	3,760	0.59	77	3.42	417	17.1	2,224	49.15	6,244	0.2	24	0.6	62

per cubic millimeter on the tenth day (Table I and Fig. 1). These latter averages were made of all cases, including those in which no myelocytes were present. Myelocytes were found in small numbers by Lippman (1) and others during the newborn period.

Polymorphonuclear basophils (mast cells). The specific granules of these cells stain a deep red color, in contrast to the brown segregation bodies of the monocytes. The granules are somewhat smaller and somewhat less refractive than those of the eosinophils and larger than those of the neutrophil. A segregation apparatus is not easily demonstrated both because of the scarcity of cells and because of the nature of the specific granules. These cells, on the whole, are smaller than

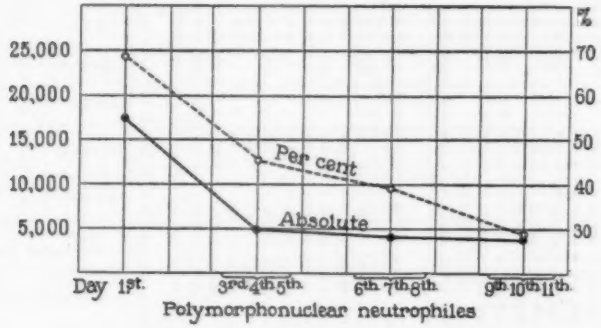

FIG. 2

either neutrophils or eosinophils. They have most commonly two or three lobes of the nucleus. No evidence was found to support the theory that the hematogenous mast cells are degenerative cell types. Mast cells were present in about half of the cases here reported, varying from 0.5 to 2 per cent when present. Slightly more were found on the first day of life than on the succeeding days (Table I). Most of the reports in the literature state that basophils are rare. Elder and Hutchison (15) failed to find any.

Polymorphonuclear eosinophils. Fixed preparations often reveal many ruptured eosinophils, and for this reason it is probably true that the count of eosinophils is frequently lower than it should be. With the supravital method the eosinophils are very easily differ-

entiated. The large specific granules stain very lightly, giving a yellow golden color. Eosinophils do not commonly contain segregation granules or vacuoles. The nucleus rarely has more than two lobes. The cells are less ameboid than neutrophils, and usually present the appearance of being distended with massive granules.

The curve for the eosinophils shown in Table I and in the accompanying chart (Fig. 3), tends to be more or less of a straight line. There appeared to be a slight rise on the fourth day. One case had 13 per cent eosinophils four days after birth. The average numbers were 2.07 per cent on the first day, 6.54 per cent on the fourth day, 3.99 per cent on the seventh day, and 3.42 per cent on the tenth day. However, the absolute number remained quite constantly between 400

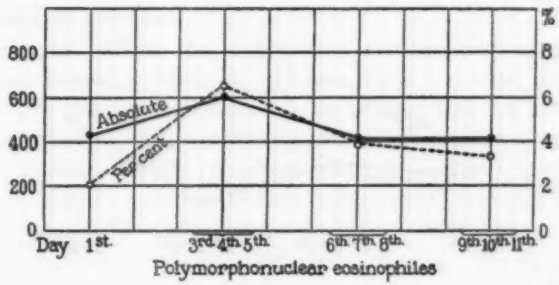

FIG. 3

and 600 cells per cubic millimeter. Lippman (1) found an average of 2.2 per cent of eosinophils at birth and 3.7 per cent at forty-eight hours after birth. Lucas, Dearing, Hoobler, Cox, Jones, and Smyth (14) recorded 1 per cent during the first four days and 3 per cent on the fifth day. Carstanjen (16) observed 1.9 per cent on the first day, but none thereafter. Fischl (17) stated that eosinophils in the newborn vary from 0.73 to 8.6 per cent. Misasi (18) observed in several infants an increase of eosinophils up to 10 per cent during the first fifteen days of life. Otherwise the percentage was similar to the figures found in adults. Takasu (19) reported these cells as varying from 0 to 9.6 per cent. Warfield (20) recorded eosinophils as varying from 0.2 to 6 per cent in the newborn.

Monocytes. There is no group of blood cells about which there has centered more controversy than these large mononuclear elements. One of the reasons for this confusion is the inadequate differential stains. The supravital staining method, as Sabin (7) and Simpson (5, 6) have shown, enables one to differentiate these cells accurately. The monocytes are characterized by an exceptionally high content of segregation granules, together with a rich mitochondrial content, both of which are well-stained by the supravital method. The segregation apparatus consists of many red-brown, non-refractive, and occasionally a few larger, refractive granules. The granules are of uneven size and appear to increase in number and size with longer exposure to the dye. These bodies are often clustered in the bay of

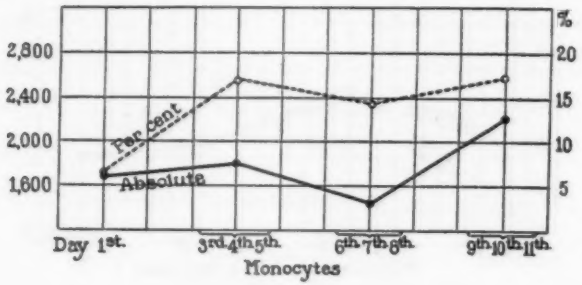

FIG. 4

the nucleus, where they characteristically form a rosette about the centrosphere. Occasionally the segregation granules are diffusely scattered throughout the cytoplasm. The mitochondria are numerous, delicate dots and filaments, best seen at the periphery of the neutral red rosette. They are smaller and more delicate than the mitochondria of lymphocytes. The cytoplasm is gray and like ground glass, in contrast to the clear, hyaline cytoplasm of the lymphocytes. The nucleus is usually indented or horseshoe-shaped, but may be round or oval. When moving, this cell usually keeps its nucleus near the center of the cell, in contrast to the lymphocyte which carries its nucleus near the front of the cell.

The accompanying chart (Fig. 4) gives the absolute and percentage values of the monocytes. It also illustrates how the percentage values

alone may easily be misleading. On the first day an average of 6.5 per cent of monocytes was found, on the fourth day, 16.88 per cent, on the seventh day, 14.29 per cent, and on the tenth day, about 17.1 per cent. The absolute numbers of cells remained relatively constant throughout this period, varying between 1,400 and 2,200 cells per cubic millimeter. These figures are much higher than those given by Lippman (1) and somewhat higher than those recorded by Lucas and his coworkers (14) from their studies of fixed preparations. The discrepancies can probably be accounted for by the fact that the monocytes are more clearly demonstrated with the supravital method. The recognition of this high relative and percentage value of these cells is of considerable importance, because more and more attention has been directed toward these so-called "endothelial leucocytes" in pathological processes.

Lymphocytes. With the supravital method, the lymphocytes, more than any other strain of cells, are likely to escape notice, but with a little practice a remarkable proficiency may be attained in identifying them. They are distinguished from all other types of cells by the character of their cytoplasm which is clear and hyaline, and relatively small in amount, by their low content of round, globular, refractive segregation granules, by their very rich content of large mitochondria, and by the character of their nuclei. The shape of the nucleus is usually round, but it may be indented, or kidney-shaped. The nuclei contain splotches indicating heavy masses of chromatin, whereas the other white blood cells have a more vesicular nuclear structure. The nucleus often changes in shape, particularly when the cell is moving. The cell has a characteristic kind of motility, in which the nucleus remains quite constantly in the anterior part of the cell, as has been shown by Sabin (7).

The accompanying graph (Fig. 5) illustrates the steady increase in the percentage of lymphocytes during the first days of life. The chart demonstrates, however, that the initial fall in the total white blood cell count is to some extent influenced by the decrease in lymphocytes, although the major portion of the fluctuation is controlled by the polymorphonuclear neutrophils, as shown in a preceding chart (Fig. 2). It will be noted that after the initial drop of the total count, the lymphocytes occupy a more conspicuous place in the blood picture.

The absolute number of lymphocytes increases, and at about the fifth to seventh day their total number becomes equal to or greater than the absolute number of polymorphonuclear neutrophils. In these studies the number of lymphocytes on the first day averaged 4,338 cells per

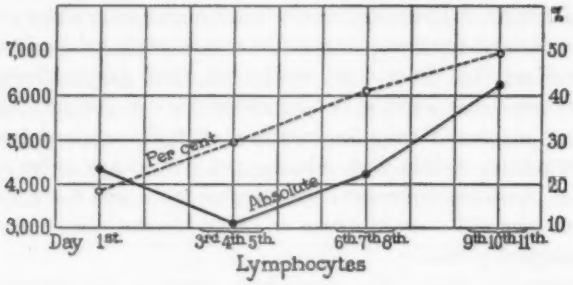

FIG. 5

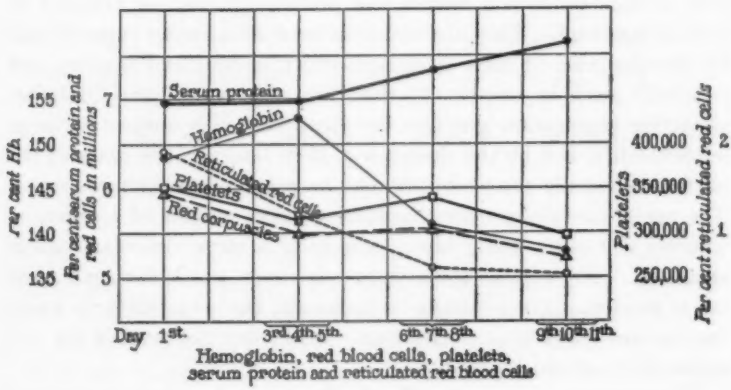

FIG. 6

cubic millimeter, or 18.34 per cent of the total leucocytes. On the fourth day they averaged 3,120 cells per cubic millimeter, or 29.6 per cent, on the seventh day, 4,251 cells per cubic millimeter, or 40.75 per cent, and on the tenth day they numbered 6,244 cells per cubic millimeter, or 49.15 per cent.

These figures are in agreement with most of the reports in the literature, but differ from those of Lippman (1), who found considerably larger proportions of lymphocytes on the first day. He stated that the absolute values of lymphocytes and polymorphonuclears were equal at forty-eight hours.

Red blood cells. The total erythrocyte count on the first day of life in the thirteen healthy infants studied varied between 5,080,000 and 6,992,000, with an average of 5,963,000 cells per cubic millimeter. After the first day, there was a gradual decline to average counts of 5,497,330 cells per cubic millimeter on the fourth day, 5,581,000 cells per cubic millimeter on the seventh day, and 5,252,800 cells per cubic millimeter on the tenth day (Fig. 6).

Aitkin (21) reported the following values: at birth, 6,130,000; first hour, 6,450,000; twelve to twenty-four hours, 7,670,000; forty-eight hours, 8,330,000; three days, 7,680,000; five days, 6,750,000, and seven to ten days, 5,890,000 cells per cubic millimeter.

Lippman (1) found a birth average of 5,200,000 cells per cubic millimeter. He stated that during the first six hours the count rises to 5,600,000 cells per cubic millimeter. Following this there is a drop to 5,400,000 cells per cubic millimeter at eighteen hours, after which the count remains fairly constant until forty-eight hours after birth.

The results of the present study on red blood cells parallel quite closely those of Lucas and his coworkers (14). They recorded an average of 5,511,000 cells per cubic millimeter on the first day, 5,244,000 on the fourth day, 5,108,000 on the seventh day, and 4,130,000 cells per cubic millimeter on the tenth day. Mayers (22) studied 41 cases and stated the birth average to be 7,630,000 red blood cells per cubic millimeter.

Whether the increased cell count of the newborn represents a concentration of the blood due to dehydration, or is a manifestation of increased hematopoietic tissue activity has been debated for many years. Aitkin (21), Elder and Hutchison (15), Frank (23), Lépiné (24), Schiff (11), and others favor the former view, whereas Dupérié (25), Hayem (26), Lippman (1), and others favor the latter. The studies reported here give evidence against the concentration theory in that the curve representing the concentration of the proteins of the serum does not run parallel with the curve representing the concentration of red blood corpuscles.

Young red blood cells. Nucleated red blood cells (normoblasts) were seen in 38.5 per cent of the cases on the first day of life, but were rarely seen afterward. Anisocytosis, moderate poikilocytosis, and some diffuse basophilia were always seen on the first day. Reddish-brown bodies staining with neutral red, and also mitochondria were seen in some red blood cells, which is evidence of immaturity. Reticulocytes averaged 1.91 per cent on the first day and rapidly declined to the normal level (Fig. 6).

Calhala and Daunay (27) found a physiologic increase in reticulated red blood corpuscles at birth up to 20 per cent in a few cases. Elder and Hutchison (15) recorded no more anisocytosis than in adult blood. They found at birth from 5 to 12 erythroblasts per 100 leucocytes. Engelsen (28), many years ago, noted that there was an increase in the diameter of red blood cells of the newborn. Silvette (29) has more recently made actual measurements of 6,000 erythrocytes of 30 infants from four to forty-eight hours of age. He found mean diameters from 7.17 to 7.96 microns, with an average mean diameter of 7.45 microns. This average mean diameter is somewhat higher than that of the normal adult—7.21 microns. Seyforth and Jürgens (30) studied reticulocytes in infants. They found 6.2 per cent reticulocytes one and one-half hours after birth, 3.2 per cent twenty-four hours after birth, 2.5 per cent on the fourth day, and 2.0 per cent on the tenth day. Loos (31) and several other investigators believe that normoblasts do not occur normally in the blood of the newborn. This is contrary to the results of most of the reports.

Hemoglobin. These estimations were made with a Sahli instrument which we recognize to be not absolutely accurate, but probably correct within 10 per cent. The instrument was carefully standardized at frequent intervals. The percentages given below are according to the Haldane Scale (32). He found the mean oxygen combining capacity of the specimens of blood from the individuals he studied to be 18.5 volumes per cent, the equivalent of 13.8 grams of hemoglobin per 100 cc. of blood. Thus, with the Haldane standard, 100 per cent of hemoglobin equals 13.8 grams. On the first day an average of 148.5 per cent or 20.49 grams was recorded in the studies here reported. There was a slight rise on the fourth day to 153 per cent or 21.11 grams, after which a decided drop to 141 per cent or 19.46 grams on the seventh

day and 138 per cent or 19.04 grams on the tenth day was recorded (Fig. 6).

Williamson (33), in a large series of cases, reported the hemoglobin in grams per 100 cc. of blood. He found 23.25 grams on the day of birth. On the second and third days he found a slight decrease to 22.78 grams, while on the fourth to eighth days there were 22.12 grams and on the thirteenth day he reported a further decrease to 21.35 grams. These are somewhat higher figures than those recorded in the present study.

Blood platelets. The total number of blood platelets on the first day of life varied from 190,000 to 600,000, with an average of 350,460 per cubic millimeter. On the fourth day there was a decrease to an average of 316,000 per cubic millimeter, followed on the seventh day by a second rise to 340,000, and then a drop about the tenth day to 297,000 per cubic millimeter (Fig. 6). These figures are slightly higher than those of Lucas and his associates (14). They reported in 12 cases an average of 305,000 platelets per cubic millimeter on the first day with a range between 225,000 and 396,000. On the fourth day they found an average of 310,000 and on the seventh day 278,000. Lippman (1) reported a maximum of 500,000, a minimum of 112,000, and an average of 213,000 platelets per cubic millimeter during the first one and one-half hours of life. At forty-eight hours he found the average number to be 192,000 per cubic millimeter. Morse (34) found immediately after birth a platelet count which varied from 412,000 to 100,000 per cubic millimeter. McLean and Caffey (35) found in infants under five days of age an average count of 278,000 platelets per cubic millimeter. Slawik (36) noted the highest blood platelet counts in newborn infants between the fourth and sixth days of life. His average count for the first ten days was 320,000 platelets per cubic millimeter.

Serum protein. The concentration of the serum proteins was determined by the refractometer method. Five cases during the first twenty-four hours of extrauterine life gave values ranging from 6.11 to 7.48 per cent, with an average of 6.95 per cent of protein in the blood serum. Four determinations from the third to fifth day showed a range from 6.05 to 7.61 per cent, and an average of 6.97 per cent. Three determinations on different cases during the sixth, seventh, and

eighth days after birth gave a higher average value of 7.34 per cent. On the ninth and tenth days the serum proteins of five infants varied from 7.03 to 8.07 per cent, with a mean value of 7.65 per cent. These data (Table I, Fig. 6) indicate a gradual increase of concentration of the serum proteins in these infants during the first ten days of life.

SUMMARY

The supravital method of studying living blood cells has been applied to the blood of fifteen newborn infants from the time of birth through the eleventh day of life. The additional criteria which this method gives over that obtained by study of fixed preparations for the identification of cells reduces the number of doubtful and unclassified formed blood elements and enables one to assign the immature and atypical cells to their proper groups.

Polymorphonuclear neutrophilic leucocytes decreased in percentage and absolute values throughout the period of observations, the most precipitous drop occurring during the first days after birth. This behavior was in contrast to that of the lymphoid cells. The latter gradually increased in percentage from the day of birth to the eleventh day. The absolute numbers decreased somewhat during the first three or four days, after which they steadily increased.

Polymorphonuclear eosinophils remained quite constant, with a slight increase in absolute numbers on the third to fifth day. Corresponding to this increase, there was a definite rise in percentage values.

The monocytes were high in absolute numbers throughout the first eleven days. They did not participate in the initial decrease of total white blood cells. The monocytes followed neither the lymphoid nor the myeloid elements in their fluctuations.

Polymorphonuclear basophils maintained a fairly constant percentage (0.5 per cent) throughout the period of observation but their total number was highest on the day of birth.

Neutrophilic myelocytes and reticulated red blood corpuscles were both definitely elevated on the first day and then decreased rapidly.

The total number of red blood corpuscles decreased until about the fourth day, with a slight rise at the end of the first week, and then decreased again on the tenth day. This was in contrast to the hemoglobin values which increased about the fourth day, dropped rather

rapidly to the seventh day, and then subsided more gradually to the eleventh day.

The proteins of the blood serum increased gradually from 6.95 per cent to 7.65 per cent throughout the first eleven days, the increase being very slight during the first four days after birth.

The number of blood platelets was greater on the day of birth than at any other time, but remained rather constant.

The small number of cases studied does not permit a very accurate statistical analysis.

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THE AGLOMERULAR KIDNEY OF THE TOADFISH (OPSANUS TAU)[1]

E. K. MARSHALL, Jr.

From the Laboratory of Physiology, The Johns Hopkins School of Medicine

In a recent article, Marshall and Grafflin (1928) have described morphological and functional studies of the kidney of the goosefish (*Lophius piscatorius*). It was shown that this kidney, in spite of the presence of a few structures resembling glomeruli, can be considered as a purely tubular organ and that in it we have tubular excretion of all substances present in the urine. The importance of further studies on such a purely tubular kidney are obvious. The goosefish, although ideal in many ways as an experimental animal, is difficult both to obtain and to keep alive in captivity. For this reason an attempt was made to find a more available and hardier fish with an aglomerular kidney. The toadfish (*Opsanus tau*) fulfills both of these requirements in an ideal way and a study of its kidney has revealed that it is devoid of glomeruli.[2]

So far as I have been able to find, the kidney of this fish has been described only by Hyrtl (1851). His description of *Batrachus cryptocentrus* is evidently that of our toadfish rather than his account of *Batrachus tau*. The general topography of the kidney, ureters and bladder are very briefly described, but no account of the structure of the kidney is given.

The toadfish is quite abundant in the vicinity of Baltimore in the spring, summer and fall and is sufficiently hardy to be transported alive for long distances in a bucket or lard can half filled with salt water. Most of the specimens which I have obtained were taken from a brackish river near Baltimore. They have been found to survive in the laboratory for many months when kept in artificial sea water of

[1] Submitted for publication April 12, 1929.

[2] I am indebted to Dr. Homer W. Smith for suggesting an examination of this fish on account of its phyletic affinity to the goosefish, and also for furnishing the first specimen.

about half the normal salinity and can certainly survive for many days in media of widely varying salinity. They survive out of water at least two hours with no apparent injury. Their pugnacious disposition and vicious bite require that they be handled with thick gloves. An account of the life history, habits, and characteristics of this species and an extensive bibliography has been given by Gudger (1908).

The kidneys of the toadfish do not resemble the compact masses seen in the goosefish: they extend over a large fraction of the body cavity. At the posterior end they are fused, and run as a narrow thin band over the vertebral column. The middle portions are separate, much thicker and broader than the posterior part, and connect with a thick anterior portion which extends both mesially and laterally for some distance into the thick muscles of the back. According to Audigé's (1910) classification of teleost kidneys, it is probably only a middle kidney or mesonephros, the pronephros and metanephros being absent. A small arterial supply can be demonstrated by an arterial injection of a starch-vermillion mass, but the bulk of the blood supplied to the kidney is venous, the caudal and numerous intercostal veins being afferent for these organs. The posterior cardinal veins are the efferent channels.

The bladder is bi-lobed but the lobe on the right is usually very small in comparison with that on the left. The two lobes are in communication. The ureters pass up from the bladder on each lateral edge of the fused posterior portion of the kidney, and then disappear into the substance of the middle portions of the organs. Each ureter gives off branches of varying size which finally lead to the renal tubules. Tubules can be readily injected from the ureter with india ink under moderate pressure without rupture.

An entire kidney was carefully dissected from a toadfish about 8 inches long, cut in three pieces, fixed in Bouin's fluid, and serially sectioned at 25μ. A careful examination of this serial has failed to reveal any structures in the least resembling glomeruli. Serial sections at 10μ of portions of kidneys from other fish have been prepared and examined, but in no instance has a single glomerulus been found. The sections show that the kidney is composed of renal tubules surrounded by the abundant lymphoid tissue characteristic of the fish kidney (Plate 1, Fig. 2). Tubules and lymphoid tissue occur throughout the

kidney, but it is probable that the anterior region contains fewer tubules in proportion to the lymphoid tissue than the posterior.

The tubules appear morphologically to resemble those of the goosefish. A camera lucida drawing of a tubule isolated from macerated material is shown in figure 1.[3]

In hematoxylin-eosin sections of material fixed in Bouin's fluid, two types of epithelium can be readily identified. The greater part of the tubule beginning from the blind ending is lined with high, cuboidal, rodded epithelium (Plate 1, Fig. 3), while at the lower end there is a transition to a low cuboidal, more basophilic epithelium without

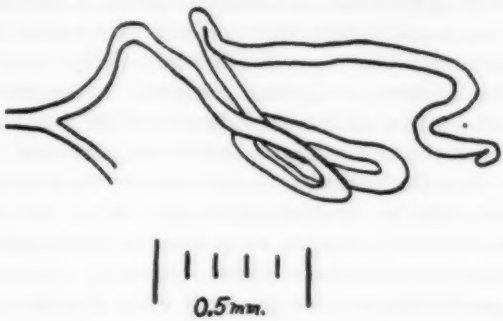

FIG. 1. CAMERA LUCIDA DRAWING OF A TUBULE FROM THE KIDNEY OF OPSANUS TAU

striations. This basophilic segment is extremely short and can be easily traced into a collecting duct. For the demonstration of brush border, material was fixed in A.O.B. fluid,[4] subsequently sectioned at 5μ, and stained with iron hematoxylin. Examination of these sections shows a beautiful brush border on the lumen side of the rodded epithelium in practically every case. It is quite possible that there may be a small segment of the tubule with rodded epithelium but without brush border, but this can only be definitely settled by a careful reconstruction from thinner sections.

[3] I am indebted to Mr. Allan L. Grafflin for teasing a portion of a macerated kidney and for making the camera lucida drawing.

[4] Glacial acetic acid, 1 drop; osmic acid 4 cc. of a 1 per cent solution; potassium bichromate, 8 cc. of a 2.5 per cent solution.

A review of what is known at present concerning fish kidneys shows that kidneys with aglomerular tubules are not of so very rare occurrence. Huot (1897, 1902) first described the purely tubular kidney as occurring in the lophobranchs. This has been confirmed for the following species: *Syngnathus Dumerilii*, *Syngnathus acus*, *Siphonostoma*, *Nerophis lumbriciformis*, *Entelurus anguineus*, *Hippocampus brevirostris*, *Hippocampus guttulatus* (Verne, 1921–22; Edwards, 1928). Guitel (1900, 1906) described the kidneys of *Lepadogaster gouanii*, *L. bimaculatus*, *L. candollii*, *L. microcephalus* and *Chorisochismus dentex* as having a single glomerulus in the persistent pronephros with the remainder of the kidney entirely aglomerular, but another species of *Lepadogaster*, *L. wildenowii*, has a glomerular kidney. These observations have been recently confirmed for *L. candollii* (Edwards, 1928). Audigé (1910) described the kidneys of *Lophius piscatorius* as aglomerular, but Marshall and Grafflin (1928) and Edwards (1928) found a very few glomeruli which the former from a careful study believed to be nonfunctional. An examination of the structure of the kidneys of deep sea fish was made by Nusbaum-Hilarowicz (1923) and he records *Gastrostomus bairdi* as possessing an aglomerular kidney, while *Argyropelecus hemigymnus*, *Chauliodus sloanei*, *Gonostoma bathyplielum*, and *Gonostoma grande* have very few glomeruli, many of which show degeneration. Dr. Dahlgren of Princeton University has shown that *Pterophyrne histrio*, belonging to the same order (*Pediculati*) as *Lophius*, has an aglomerular kidney, and allows me to mention this finding here. *Opsanus tau* completes the list of the aglomerular kidneys which have been thus far described for fish.[5]

The kidneys of many fish have been found to contain tubules which lack glomeruli. Audigé states that the mesonephros or middle kidney

[5] The kidneys of *Diodon* and *Tetrodon*, of the order Plectognathes, are stated by Edwards (1928) to have been found aglomerular by Hyrtl, but in the article quoted (Hyrtl, 1850) I can find no reference to these kidneys. In a subsequent article Hyrtl (1851) gives a description of only the gross anatomy of these kidneys, and I have not found any histological description of them. Seven genera of the order Acanthoptergyii are also mentioned by Edwards (1928) as having been found aglomerular by Guitel, but in the article quoted (Guitel 1906) only two of these are mentioned. In a subsequent paper Guitel (1908) described the other five as having a persistent pronephros but says nothing about whether or not the rest of the kidney is aglomerular.

is aglomerular in all young teleosts, while the pronephros is functional, and that in many adult forms the middle kidney or mesonephros contains few glomeruli, the majority of the tubules not possessing a glomerulus. Teleosts with many aglomerular tubules have been described also by Guitel (1906) and Edwards (1928). Policard and Mawas (1906) have found in the kidneys of teleosts diverticula of the tubules which do not possess glomeruli but end in a blind cul-de-sac.

Among the cyclostomes, elasmobranches, ganoids, dipnoids and amphibians I can find no instance recorded of the occurrence of an aglomerular kidney or even of tubules without glomeruli, and it is almost certain that such structures will not be found in any of these groups. However, Regnaud and Policard (1902) have described the presence of blind diverticula given off from tubules in the kidney of the lamprey (*Petromyzon fluviatilis*). In the class of reptiles, similar diverticula have been described by the same observers (Regnaud and Policard, 1903–04) in the kidney of snakes. This has been confirmed by Zarnik (1910). A peculiarity of the reptilian kidney, which may be of importance in the present connection, is the fact that the central part of the glomerulus consists of a dense mass of connective tissue instead of capillaries which occur only on the outer portion. This, especially in the lizards and snakes, reduces very much the capillary surface of the glomerulus (Regnaud and Policard, 1903–04; Cordier, 1928).

It appears, therefore, that aglomerular kidneys may be found to be of rather wide occurrence in marine teleosts, and that the presence of a glomerulus at the beginning of a tubule is by no means a necessity for renal excretion. The excretory function of the tubule would appear to be definitely demonstrated.

Physiological studies of the kidney of the toadfish are still in progress and will be reported upon at some future date.

SUMMARY

The kidney of the toadfish (*Opsanus tau*) is a purely tubular organ, possessing neither glomeruli nor any structures resembling them. The occurrence of tubules without glomeruli in the kidneys of the lower vertebrates is not unusual.

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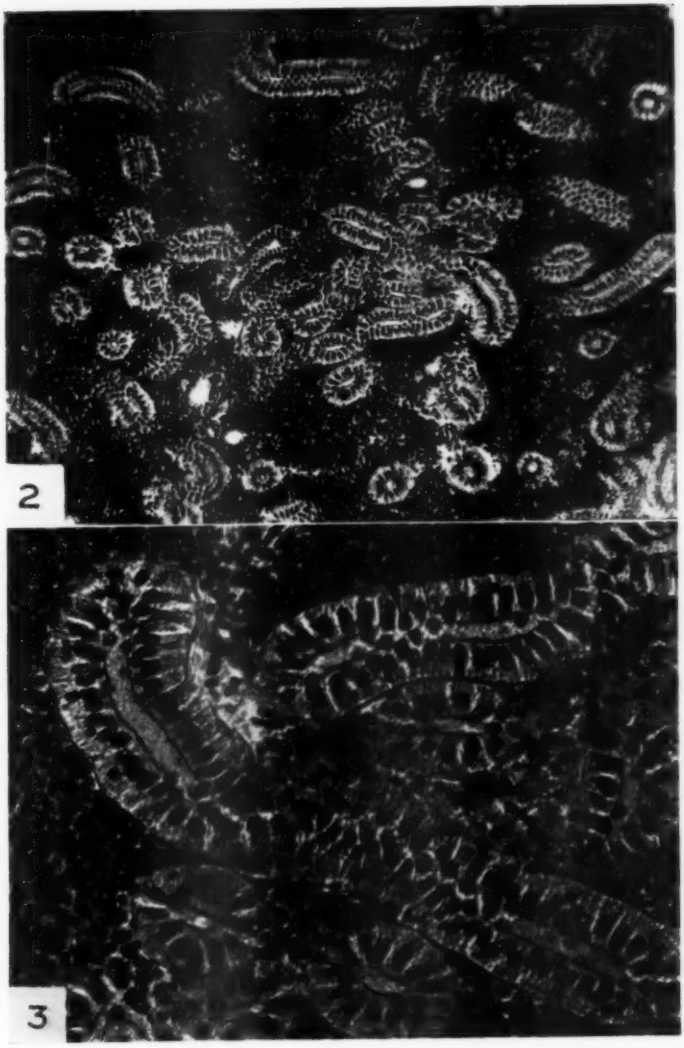
PLATE 1

FIG. 2. Low-power photograph of the kidney of *Opsanus tau*. × 110.
FIG. 3. High-power photograph of a portion of the field shown in fig. 2. × 370.



UNIV OF

REPORT OF A CASE OF HERPES ZOSTER OPHTHALMICUS TREATED WITH CONVALESCENT SERUM[1]

JONAS S. FRIEDENWALD

From the Wilmer Ophthalmological Institute of the Johns Hopkins University and Hospital

The following case is reported because it illustrates an unexpectedly favorable outcome in an unusually severe instance of ophthalmic herpes zoster, and because this outcome was associated with the application of a form of treatment which has not, we believe, been applied, heretofore, in this disease:

The patient was a woman of 47, a former nurse, whose personal and family history are not relevant to the present illness. On September 21, 1927, she developed a lesion resembling simple herpes on the left cheek. One week later she began to suffer with neuralgic pains over the left side of her face, hyperesthesia of the forehead, and pain in the left eye. On October 3 the left eye became inflamed. She was first seen on October 4, when a moderate congestion of the left eye was found, and several minute superficial infiltrates were noted in the left cornea. On October 5 the pain was worse. There was a diffuse hyperemia throughout the region of the ophthalmic branch of the left trigeminal nerve, and many minute vesicles in the skin in this area.

During the next few days the condition progressed, typical zona lesions developed and extended from the tip of the nose to the vertex of the scalp. There were lesions on the nasal mucous membrane, on the palpebral conjunctiva, corneal infiltrates of increasing size and iritis of the left eye, great edema of the lids, excruciating pain, and fever up to 100°F. The general physical examination was negative. No other cutaneous lesions were found.

On October 9, five days after the onset of the cutaneous lesions and eleven days after the onset of the neuralgic pains, the patient was given an intramuscular injection of 8.5 cc. of the blood serum of another patient who, six weeks before, had recovered from a severe case of perineal herpes zoster. Five hours after the injection the patient was more free from pain than she had been since the onset of the attack. By the next morning the edema of the lids had markedly decreased, and from this time on the skin rash rapidly subsided. The iritis, however, was very stubborn, and its treatment was complicated later by

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[1] Read before the Johns Hopkins Hospital Medical Society, February 6, 1928.

the fact that the patient developed a local allergy, first to atropin, and then to all other mydriatics. There were also severe neuralgic pains, together with numbness and hyperesthesia of the skin, which persisted for about two months. In December the vision of the left eye was found to be 6/12; by February, 1929 it had improved to 6/6.

Cases of ophthalmic herpes zoster with such extensive lesions almost always result in complete loss of vision from the corneal involvement. This has been known for a long time; indeed, Jonathan Hutchinson stated that when the tip of the nose was involved the eye would be lost. Cases which, like the one reported, show corneal involvement early in their course, are particularly serious, and at the outset recovery of vision up to 6/6 was hardly to be anticipated.

Several other features of this case are of sufficient interest to warrant mention,—in particular, the iritis, which is not commonly found in these cases. The fact that herpes simplex occasionally precedes an attack of herpes zoster has been the subject of some discussion in the recent literature. It may also be worthwhile to mention that the patient gives a history of having had chicken pox in childhood, whereas most cases of herpes zoster appear to have escaped this childhood malady. No history of exposure to chicken pox or to herpes zoster within the incubation period of the illness could be obtained from the patient.

Cases of herpes zoster present themselves too rarely in ophthalmic practice to afford an adequate basis for testing the efficacy of any form of treatment. The writer feels justified, therefore, in bringing this interesting coincidence to the attention of those whose clinical material in this disease is more voluminous. No conclusions in regard to the usefulness of serum therapy can be drawn from the experience in this single case.

AMYLASE CONCENTRATION IN NORMAL URINE[1]

WALTER BREM MAYER AND HAROLD FINKELSTEIN

From the Duke University and the Johns Hopkins Schools of Medicine

The concentration of amylase in the urine has been used diagnostically as an index of kidney function. However, a series of determinations of the concentration of amylase in 26 specimens of urine obtained from three apparently normal individuals (Tables I and II) would seem to indicate that except for those collected about 9 a.m. there is too wide a variation for the test to be of any clinical value. It has been suggested that although the amylase concentration in individual specimens might vary because of the different intervals in the time of collection of urine, that of 24-hour specimens might be constant. However, as may be seen in Table III, the amylase concentration in four 24-hour specimens from the same individual varied widely and was from 3 to 6 times as high as that from another normal adult (Table II). These variations are apparently related, though not constantly, to the volume and specific gravity of the specimens. In this study the viscometric method[2] was used: 0.3 cc. of fresh urine was added to 10 cc. of a 3 per cent starch solution at pH 7.0 and kept at 34°C. in Ostwald viscosimeters. The viscosity was determined at intervals of 3 to 10 minutes and the time required for a 20 per cent reduction in the initial viscosity was noted. The results in Tables I, II and III are expressed in units of amylase per cubic centimeter of urine, *i.e.*, the amount of amylase which requires 60 minutes to reduce the initial viscosity 20 per cent No deterioration in amylase concentration was noted in specimens which were kept overnight at 4°C., with and without toluol.

[1] Submitted for publication March 1, 1929.

[2] Davison, W. C.: A viscometric method for the quantitative determination of amylase. *Bull. Johns Hopkins Hosp.*, 1925, **37**, 281-282.

TABLE I

Amylase concentration in normal urine

SUBJECT	DATE	TIME	VOLUME	UNITS PER CUBIC CENTIMETER OF URINE
			cc.	
A.	March 14, 1928	9:00 a.m.	175	5.7
	March 21, 1928	8:30 a.m.	170	8.8
	March 22, 1928	8:45 a.m.	188	6.6
	March 26, 1928	9:15 a.m.	260	5.0
	March 27, 1928	9:15 a.m.	420	3.6
	March 30, 1928	8:30 a.m.	146	6.9
	April 4, 1928	9:00 a.m.	175	6.0
A.	March 14, 1928	12:20 p.m.	175	2.4
	March 19, 1928	10:45 a.m.	556	4.1
	May 3, 1928	11:15 a.m.	407	0.8
	May 4, 1928	12:00 n.	65	6.6
	May 9, 1928	10:30 a.m.	91	2.9
A.	March 14, 1928	2:40 p.m.	368	1.4
	May 2, 1928	4:00 p.m.	360	3.0
	May 6, 1928	4:15 p.m.	308	1.8
	May 10, 1928	3:30 p.m.	50	6.4
A.	May 14, 1928	9:00 p.m.	341	1.5
B.	March 4, 1925			2.8
	March 9, 1925			2.0
	March 11, 1925			3.1
B.	May 8, 1928	10:00 a.m.	44	12.9
	May 10, 1928	3:00 p.m.	277	4.8
			SPECIFIC GRAVITY	
C.	March 20, 1925	2:30 p.m.	1.033	23.5
	March 21, 1925	11:00 a.m.	1.026	12.5
	March 27, 1925	8:30 a.m.	1.030	28.3
	March 27, 1925	2:30 p.m.	1.028	19.8
	March 28, 1925	8:30 a.m.	1.029	8.6
	April 3, 1925	8:30 a.m.	1.017	9.4
	April 3, 1925	2:30 p.m.	1.025	16.5

TABLE II

Daily variation of urinary amylase concentration

SUBJECT AND DATE	TIME	VOLUME	UNITS PER CUBIC CENTIMETER
		cc.	
A. March 14, 1928	9:00 a.m.	175	5.7
	12:20 p.m.	175	2.4
	2:40 p.m.	368	1.4
	9:00 p.m.	341	1.5
	24-hour specimen	1159	2.1

TABLE III

Amylase concentration in 24-hour specimens

SUBJECT AND DATE	VOLUME	SPECIFIC GRAVITY	UNITS PER CUBIC CENTIMETER
	cc.		
C. (March 20–21, 1925)	1000	1.027	12.3
C. (March 21–22, 1925)	1360	1.025	11.3
C. (April 15–16, 1925)	1000	1.028	10.2
C. (April 16–17, 1925)	1550	1.019	7.4

SARCOID OF BOECK IN THE NEGRO

Report of a Case

LEON GINSBURG, M.D.

From the Department of Dermatology, The Johns Hopkins Hospital and Medical School

Boeck's sarcoid is fairly common in the white race but seems to be relatively uncommon in colored people. After a search of the literature, I was able to find only eight reported cases and the majority of these were in Society Transactions. Only those cases were accepted in which biopsies had been done, because in most instances it is impossible to establish a diagnosis from the clinical appearances alone.

Kaposi (1), in 1899, first used the term "sarcoid" to designate a collection of tumors on the skin, most of which, however, have since been removed from this group. In the same year Boeck (2) described the affection known as "Multiple Benign Sarcoid of Boeck," and in 1910 Darier (3) gave us the modern classification of lesions of this character which is as follows: (*a*) multiple benign sarcoid of Boeck; (*b*) subcutaneous sarcoid of Darier-Roussy; (*c*) erythema-induratum-like sarcoid of the extremities; (*d*) Spiegler-Fendt type.

The Boeck type is the most common one and is characterized by nodules, papules and infiltrated plaques. The sites of predilection are the face, back, shoulders and extensors of the arms. The lesions may be single or very numerous and vary in size from a pin-head to a small-sized plum. They may be flesh-colored, red, brown or yellowish brown. Upon diascopic pressure minute yellowish foci, as observed in lupus vulgaris, may be seen and it was this characteristic that led Boeck later to suggest "miliary lupoid" as a better term. Quite frequently, and especially in cases with single lesions, minute blood vessels may be seen on the surface. On palpation the lesions are semi-soft and elastic; they are located in the skin and move with it. They tend to involute spontaneously and leave a brownish pigmentation or an atrophic scar. The regional lymph glands are sometimes involved.

Histologic examination reveals nests of epithelioid cells with pale-staining, vesicular nuclei, sharply separated by connective-tissue septa. At the periphery of the nests round cells and occasionally giant cells may be found, and, in the early stages a few mast cells may be present. Mitoses are very unusual. The changes in the epidermis are purely secondary. The picture is so characteristic that Darier claims the diagnosis can be made at a glance.

The Darier-Roussy type consists of hazelnut to plum-sized, round or oval subcutaneous nodules which may develop slowly and as a rule are not associated with any subjective symptoms. The upper part of the trunk is the place of election. The histologic changes approximate more closely those found in the more common forms of tuberculosis of the skin than in Boeck's sarcoid.

The third type closely resembles the erythema induratum of Bazin, and Darier has given to it the name, "sarcoïdes noueuses et nodulaires des membres." It is usually seen in adult females and occasionally ulcerates. Tubercle bacilli have been demonstrated in inoculated animals by Ravaut and Thibierge (4), Carle (5) and Colcott Fox (6). Sutton (7) says that the tuberculin test is usually positive in this variety.

The Spiegler-Fendt type is characterized by the occurrence of multiple, deeply seated tumors on the extremities and trunk and clinically resembles both the first and second types. These tumors never ulcerate and tend to heal spontaneously. Microscopically the picture is suggestive of that of a round-cell sarcoma. Giant cells and epithelioid cells occur in small numbers. The fact, however, that the tumors never metastasize and show no tendency to regress spontaneously assists in differentiating this type of sarcoma. Sweitzer (8) believes that it is probably a lymphogranuloma of infectious origin and should be removed from the group of sarcoids.

ETIOLOGY

Most observers believe that sarcoid is a variety of tuberculosis of the skin. Boeck found tubercle bacilli in the nasal smears from one of his cases. Kyrle's (9) work on a case of sarcoid is most suggestive. He observed a case of Boeck's sarcoid in a Serbian war prisoner and was able to demonstrate the tubercle bacilli without difficulty in

early lesions. In lesions of 10 days' duration he found numerous acid-fast organisms; they were less numerous after 21 days, and on the 36th day, when the classical picture of the disease was fully developed, no tubercle bacilli were demonstrable. Ruete (10) also found the tubercle bacillus in lesions 10 days old. Wende (11) described a condition which he termed "nodular tuberculosis of the hypoderm" in which he found tubercle bacilli. Goeckerman (12) believes that this was a case of Boeck's sarcoid and that Wende was the first to find tubercle bacilli without being aware of the true diagnosis. General pathologists, when shown sections of sarcoids, often unhesitatingly pronounce them to be tuberculous.

The school not in favor of the tuberculous origin of this affection bases its arguments chiefly on the fact that the tubercle bacillus is rarely demonstrated in sections; that inoculation experiments in animals fail to produce the picture of sarcoid and that the tuberculin reaction is usually negative. Jadassohn and Morgenstern (13) (quoted by Goeckerman), however, state that the negative tuberculin reaction is due to a tissue anergy.

RÉSUMÉ OF CASE REPORTS OF BOECK'S SARCOID IN NEGROES

After a search of the literature of the past 18 years, I was able to find only eight cases. Seven of these were presented at various dermatological society meetings and one, Wright's case, was reported in an original article.

Case 1 (14). Male, aged 21, presented numerous nodules with a predilection for the nape of the neck. The blood Wassermann was positive but the biopsy findings were typical of the Boeck type of sarcoid.

Case 2 (15). Female, aged 40, presented nodules on the neck, ear, elbow and face; duration, 3 years. Inoculation of material into a guinea-pig was negative for tuberculosis. Histological examination showed the characteristic picture of Boeck's sarcoid.

Case 3 (16). Female, aged 28, showed numerous pea-sized nodules located on the face, chest and elbows. In addition there was a violaceous non-infiltrated patch located on the nose and two infiltrated patches of similar nature located on each cheek. The blood Wassermann test was negative. The biopsy was characteristic.

Case 4 (17). Female, aged 30, showed numerous nodules on the cheeks, right ear, eyelids and lips. The biopsy was characteristic.

Case 5 (18). Unusual Case of Lichenoid Sarcoid. Female, aged 27, married, at the age of 17 developed depigmented areas on buttocks, thighs, arms, shoulders and upper part of back. On these areas there later developed shiny, flat-topped, grouped papules, associated with a slight amount of itching. At the age of 21, she developed pulmonary tuberculosis. Examination for tubercle bacilli in the sputum and tissue inoculations into two guinea-pigs were twice negative. Sec-

FIG. 1. SHOWING LOCATION AND APPEARANCE OF SARCOID NODULES

tions stained for tubercle bacilli were also negative. Biopsy showed the typical structure of sarcoid.

Case 6 (19). Female, aged 23, sudden onset of lesions on arms, buttocks, lower legs and trunk. The eruption consisted of depigmented macules and slightly elevated macules and papules. The physical examination and X-ray were negative for tuberculosis. The biopsy was typical. Lesions at a later date showed apple-jelly nodules.

Case 7 (19). Female, aged 26; the eruption began with a single lesion on the forehead, and others developed slowly on the extensor surfaces of both arms, buttocks and legs. The biopsy was typical.

FIG. 2. LOW-POWER MAGNIFICATION, SHOWING CHARACTERISTIC NESTS OF CELLS LYING IN THE CUTIS

Case 8 (20). Male, aged 50, presented numerous dark, violaceous, deeply infiltrated nodules, varying in size from a pea to a filbert, located in the epigastrium, the left costal region, and on the arms. The biopsy was typical of sarcoid, with many giant cells.

CASE REPORT

History. The patient was a male mulatto, aged 24, who gave a negative family and past history for tuberculosis (fig. 1). The eruption began on his face in 1925, about 3 months before admission to the skin clinic. He had been treated by

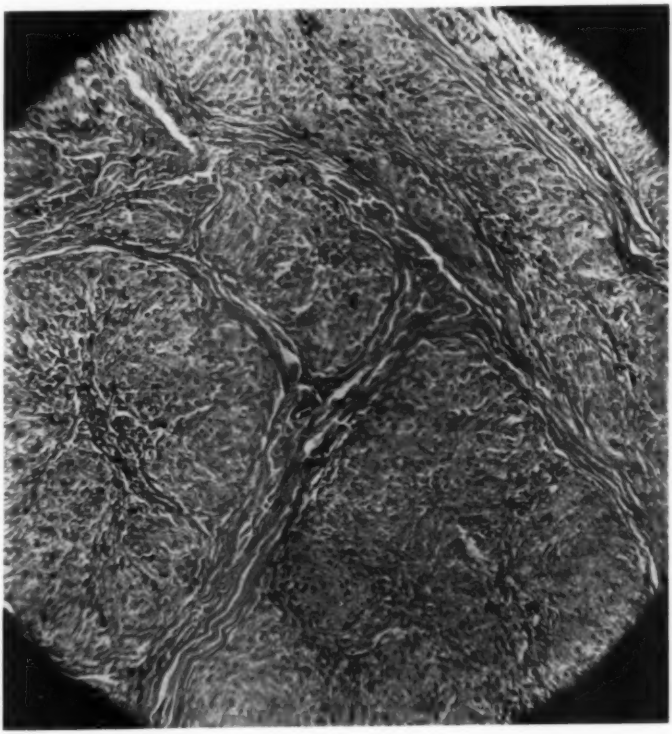

FIG. 3. HIGH-POWER MAGNIFICATION, SHOWING PALE STAINING EPITHELIOID CELLS WITH IRREGULAR SHAPED AND VESICULAR NUCLEI

physicians in another city, and various diagnoses had been made, including syphilis and keloid. There were no subjective symptoms.

Examination. The patient was well nourished and the general physical examination was negative. The eruption, which everywhere presented similar characteristics, was located in the right external orbital region, on the right upper

eyelid, near the inner canthus of the left eye, on the vermillion of the lips, on the chin and back of the neck and arms. The lesions were discrete, round, bluish red, and slightly yellowish colored, keloid-like, firm nodules. The yellow tinge was quite marked in some of the lesions and xanthoma was considered. Further observation was not possible as the patient left town after making only a few visits to the clinic.

Laboratory examination. Three blood Wassermanns were negative. The roentgenologic report was as follows: "Fibroid consolidation of the roots of both lungs, infiltration a little more marked on the right side, with big mediastinal glands suggesting tuberculosis." No tuberculin test was done. Inoculation of a nodule into the groin of a guinea-pig did not produce regional glandular enlargement. A few sections were stained for tubercle bacilli with negative results.

Histologic examination. Examination under the low power revealed a tumor located in the cutis made up of closely packed nests or strands of cells, sharply separated by normal or compressed connective-tissue septa (fig. 2). The cells were of the epithelioid type with nuclei of irregular or vesicular shape (fig. 3). There were a few small round cells here and there in these nests but no inflammatory reaction in the connective tissue. In some places the nests of cells were divided irregularly by ramifications of connective tissue. In the center of some of these cell strands there were dilated capillaries. In a section taken from a smaller lesion, there was a more marked round-cell infiltration present both in the connective tissue and in the epithelioid nests. Mitoses, giant cells and caseation were not present. Except for a slight amount of hyperkeratosis the rete was normal.

CONCLUSIONS

1. Judged by the infrequency of reports in the literature, it appears that Boeck's sarcoid is relatively uncommon in the negro race as compared with the white race.

2. A case of Boeck's sarcoid in a mulatto is reported which showed the classic histological picture but which presented a rather unusual clinical appearance.

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PROGRAMS OF THE MEDICAL SOCIETY OF JOHNS HOPKINS HOSPITAL

APRIL 8, 1929

1. The use of isolated radiations in biological experimentation: The effect of infra-red radiation on the growth of the rachitic rat. Ethel N. Luce-Clausen, M.D., Rochester, N. Y.
2. Experiences with fifty-five cases of tularemia occurring in Dayton, Ohio. Walter M. Simpson, M.D., Dayton, Ohio.

MAY 13, 1929

1. Election of officers.
2. A case of acute abdominal pain in rheumatic fever. G. P. Berry, M.D.
3. Some recent studies in arthritis. Leonard G. Rowntree, M.D., Mayo Clinic, Rochester, Minn.

BOOK REVIEWS

Urological Roentgenology. A Roentgen Atlas of the Genitourinary Tract With Case Histories and An Outline of Urology in Its Relations to Roentgenology. By HUGH H. YOUNG and CHARLES A. WATERS. Annals of Roentgenology, volume seven. 499 pp. 4°. $20.00. (*Paul P. Hoeber, New York, 1928.*)

This book impresses one very greatly at first sight. It is well printed on excellent paper and the illustrations, with one or two exceptions, are exceedingly clear and well done. On investigating the subject matter, one finds that an original scheme had been followed. For the benefit of those who must interpret urograms, the book has been arranged as a concise treatise on urology, into which have been inserted the discussions of the purely radiological aspects. This should make the book extremely helpful to roentgenologists who must, perforce, interpret urograms. The general arrangement is that of Young's Practice of Urology. The collection of urograms that are reproduced in this book is very complete and includes all the ordinarily found pathological conditions as well as a considerable number of rarities.

One might call attention to a few omissions: In the first chapter, air-pyelography is dismissed with a few words. While this procedure is not devoid of danger, there are certain cases in which it provides a means of unraveling otherwise insoluble problems. One also misses a statement of the fact that the shadows of large diverticula can be distinguished from bladder shadows by means of their smooth and regular contour. The valuable air-injection test of Vaughan and Rudnick, for rupture of the bladder, is not included.

The reviewer feels particularly enthusiastic about the section on calculi. The pictures here are numerous and excellent, and cover the field thoroughly. There can be no question that the entire book will be of the greatest value. Like the other publications of the senior author, it aims to go down to fundamental facts, enabling the reader not only to profit from examples given but also, by means of the firm foundation gained, to solve new and unforeseen problems.

D. M. D.

Diabetic Surgery. By LELAND S. MCKITTRICK and HOWARD F. ROOT. Illustrated with 79 engravings and 2 colored plates. 267 pp. $4.25. (*Lea and Febiger, Philadelphia, 1928.*)

The appearance of this little book on diabetic surgery is timely. While the outlook for the diabetic with surgical complications has been greatly improved in recent years, it nevertheless seems true that surgical complications have not diminished in number. The diffusion of knowledge on this matter is of especial importance to internists because so many of these complications are avoidable.

The medical treatment reflects the excellent methods of Joslin in whose clinic at the New England Deaconess Hospital the book was written. The illustrations in the book are not very clearly reproduced. If some of them had been made from drawings, even in a semi-diagrammatic fashion, it would have been easier to understand what the authors are trying to illustrate. There are two colored plates of very doubtful value. The book contains a good many statistics.

It is unfortunate that the publishers find it necessary to charge such an (we are tempted to say) exorbitant price ($4.25) for this small volume. It is to be hoped that some day the burden of unnecessarily expensive and elaborately printed medical textbooks will be lifted from our shoulders.

G. A. H.

Clinical Electrocardiography. By Sir Thomas Lewis. Fourth Edition. 128 pp. 8°. (*Shaw and Sons, London, 1928.*)

This little work has for many years been the classical handbook on elementary electrocardiography. For clarity, conciseness, and completeness it has no equal. In some brief 120 pages Sir Thomas Lewis outlines the fundamental principles of the electrocardiography and analyzes and discusses all of the principle curves seen in the various cardiac disturbances.

The fourth edition is no exception. Indeed, there is very little alteration in the text except for the addition of the electrocardiographic changes seen in coronary thrombosis. In this edition Sir Thomas Lewis still holds firmly to the theory of the "wave of negativity" and makes no mention of Craib's new "doublet" theory. Hence he still adheres to his former principle of including in this volume only such material as is uniformly accepted or has been definitely proven. Whether or not the newer theory will come to be accepted is mainly a matter of academic interest. It will in no way invalidate the fundamental principles of the interpretation of the electrocardiographic curves associated with the various disordered actions of the heart. In fine, this book admirably fulfills the purpose for which it was written: "To serve as an introduction to students of electrocardiography and as a guide to practitioners and hospital physicians in understanding curves that may be taken by others from patients in their charge."

H. B. T.

The Treatment of Diabetes Mellitus. By Elliott P. Joslin. Fourth edition, enlarged, revised and rewritten. Illustrated. 998 pp. $9.00. (*Lea and Febiger, Philadelphia, 1928.*)

The appearance of this fourth edition will be very welcome. The author's well marked sense of the dramatic and his ability to write in a lucid and picturesque fashion makes the reading easy.

The book opens with an excellent warning—"The dietetic treatment of diabetes is extraordinarily simple and yet so engrossing that unless the physician takes care he will fall into schematic ways and forget that it is the patient who comes for

treatment and not the diabetes. Each is a case unto itself." The principle of undernutrition is stressed constantly; excess of food brings on diabetes, excess of food makes it worse; the normally nourished or slightly undernourished patient does best. On the other hand, Joslin is in agreement with what would appear to be the general trend of opinion in this country as to the advantages of a more liberal carbohydrate ration. The diabetic, no matter how severe, who is properly adjusted as to insulin dosage and diet, can take as a minimum 100 gms. of carbohydrate and will require as a maximum but 50 units of insulin to care for it. Not ten of his 2000 patients who are using insulin need over 50 or take as much as 60 units. He deals fairly with various dietary fads: the high carbohydrate, high insulin regime of Sansum Blatherwick and Bowden, the high fat diets of Newburgh and Marsh, and the low protein diet of Petrén. One is surprised to learn that this distinguished clinician gave opium to all of his patients: "Alle Patienten haben ohne Ausnahme Opium erhalten, und zwar dreimal täglich 7 bis 10 Tropfen Tinctura opii." Whatever its other faults, treatment has at least advanced so far in this country that no reputable student of diabetes would be willing to take responsibility for such an extraordinary regime. Joslin does not believe in "insulin refractory" diabetics—patients with true uncomplicated diabetes which is uninfluenced by insulin.

The section on coma is excellent. The methods of treatment are conservative, the warnings against the use of intravenous medication important and timely. The only points about which question may seriously arise are those relating to routine gastric lavage "in all cases where the carbon dioxide is under 20 volumes per cent," and the absolute contraindication to the use of alkalies. The first of the above rules sounds a little to the reviewer like one of the "schematic ways" against which the author elsewhere warns. Gastric lavage is no trivial procedure in an unconscious patient.

The author holds rigidly to the rule that glycosuria should not be tolerated. He lays stress on arteriosclerosis as an increasingly frequent complication of the disease. He is inclined to blame the high fat diets, and especially the diets high in cholesterol as the cause of the increase in this condition. Oddly enough, however, the figures quoted on the author's own cases (page 252) seem to prove that those with least arteriosclerosis have the highest blood cholesterol values.

Certain portions of the book might well be omitted, as, for example, that dealing with the examination of the blood, urine and respiration. Many of the tests described are seldom used, and reference to the literature should be sufficient.

There is little doubt that this is the most valuable book, at least in English, that has been published upon diabetes. It is a summary of the views of one of the foremost specialists in this disease. It is surely a matter for congratulation that there is in this country an organization so well equipped and headed by so competent a director for the treatment of such an important chronic disease as is the New England Deaconess Hospital under the charge of Dr. Joslin.

G. A. H.

The Duodenum. Medical, Radiologic, and Surgical Studies. By PIERRE DUVAL, JEAN CHARLES ROUX, and HENRI BÉCLÈRE of the Surgical Clinic, Faculty of Medicine, Paris. Translated by E. P. Quain, M.D. 212 pp. $5.00. (*C. V. Mosby Co., St. Louis, 1928.*)

This book deals with duodenal deformity associated with chronic cholelithiasis, essential periduodenitis and obstruction of the third portion of the duodenum. A chapter is devoted to duodenostomy, one to x-ray studies of duodenal ulcer, and another to toxic symptoms associated with chronic duodenal retention.

In discussing the relation of duodenal deformity to chronic cholelithiasis, the frequent occurrence of adhesions due to gall-bladder disease is emphasized. In the authors' x-ray studies, the duodenum was frequently found displaced upward and backward; it cannot be visualized with the patient in the antero-posterior position. The duodenum comes into view when the patient is rotated. In some cases the release of adhesions around the duodenum permits it to regain its normal contour. Radiographic studies are relied upon and little importance is attached to fluoroscopic examinations.

Essential periduodenitis is a term the authors apply to adhesions around the duodenum. They believe this condition may be due to transitory inflammatory disease of the gall-bladder or duodenum. The duodenal deformity resembles that of duodenal ulcer. If the periduodenitis is marked, it is sometimes necessary to perform a gastro-enterostomy for relief of symptoms.

Chronic obstruction of the third portion of the duodenum is discussed in detail. The etiological factors stressed are acute angulation at the duodenojejunal junction and compression by mesenteric vessels. In the diagnosis, emphasis is placed upon dilatation of the duodenum as evidenced by x-ray studies. In the treatment, favorable results are reported from duodenojejunostomy. The indications and technique of the operation are discussed in a separate chapter.

In the review of chronic retention, with slight dilatation of the duodenum, the authors call attention to a syndrome consisting of nausea, anorexia, weakness, nervous depression, and loss of weight.

The book should be of interest to all students of gastro-intestinal diseases.

E. B. F.

Diseases of Children. Edited by Sir Archibald E. Garrod, Frederick E. Batten, Hugh Thursfield and Donald Paterson. 2d ed. $15.00. (*Edward Arnold and Co., London, 1929.*)

"If it isn't described in Garrod, Batten and Thursfield it can't be found anywhere" is a remark often heard among pediatric internes. The first edition (1913) with its numerous descriptions of rare cases and the splendid neurological section was a tremendous help in diagnosis. The present edition, by the last two of the four editors, has retained all of the virtues of the first issue and has had added several more. Is there a better description of pediatric neurology than that found in the 200 pages in the first edition, written by the late Frederick E. Batten? The

answer is yes; for in the present revision of this section W. G. Wyllie has splendidly succeeded in painting the lily. Functional nervous diseases are adequately and delightfully handled by H. C. Cameron; even narcolepsy is included. Is there anyone better fitted to write the chapter on the diseases of the genito-urinary system than J. C. Spence? Has anyone performed this task anywhere nearly as well? The answers are both in the negative. The presentation of immunity, prophylaxis, therapeusis and blood transfusion, by Douglas McClean and Eric I. Lloyd, should be the foundation of every physician's knowledge. Its inclusion under "Prolegomena" is very logical. Scurvy and oedema by G. F. Still are splendid. Diseases of the liver, pancreas and peritoneum by H. Morley Fletcher leave nothing to be desired. The blood and lymphatic systems by Hugh Thursfield are invaluable; nothing could be more complete or better arranged than his classification of the conditions responsible for splenic enlargement. G. A. Harrison presents diabetes mellitus so that a student can readily absorb it and a specialist profit from it. The chapter on bone and joint diseases by Sir Humphry Rolleston and H. A. T. Fairbank cannot be replaced in the armamentarium of any physician who sees many children, for descriptions of many rare and puzzling cases are included. F. J. Poynton's chapter on rheumatism, chorea and Still's disease is what is to be expected—excellent. David Nabarro has written a very fine, concise and practical chapter on syphilis. These examples are only a few of the many virtues of this issue. The medical profession should be grateful to Dr. Hugh Thursfield and to Dr. Donald Paterson for editing so splendidly this second edition of an indispensable book.

W. C. D.

The Principles of Ante-Natal and Post-Natal Child Hygiene. By W. M. FELDMAN, M.D., B.S., M.R.C.P., F.R.S. (Edin.). 743 pp. $7.00. (*John Bale's Sons & Danielsson, Ltd., London, 1927.*)

This treatise is an endeavor to present in a single volume the known facts having to do with the wellbeing of the child. The author properly insists that the term "child hygiene" is concerned with everything that tends to promote the health of the child during its various stages of ante-natal and post-natal development. He shows that the loss of potential life after conception through the first month after birth is five times as great as that from the first month to the end of the first year, hence the necessity of discussing factors of heredity, ante-natal environment and the conduct of labor as well as post-natal factors in a complete study of child hygiene.

A chapter is devoted to a rapid review of the place the child occupied in the thought and practice of ancient civilizations during the middle ages and its recognized importance in our own day.

Another chapter takes up the application of biometrics to child hygiene. It discusses the means of reaching sound conclusions through statistical methods and points out the pitfalls which may falsify results. The various factors affecting mortality rates of mothers and infants are considered.

The approved information on post-natal hygiene, the care that the baby should receive, its hours of sleep, the preparation of its food, etc., are discussed. The danger of impure cows' milk is referred to as well as the added element of safety which comes from either pasteurization or quick boiling. The history of artificial feeding of infants is rapidly drawn. (The percentage method of feeding was introduced by Dr. Rotch of Boston and not of Philadelphia as stated.)

Perhaps more stress should be laid upon the present satisfactory use of powdered milk and less upon the antiquated methods of calculating milk formulas and whey mixtures.

More valuable is the chapter on the rôle of sunlight and its substitutes, and those upon the hygiene of the teeth and sense organs.

The presentation of data concerning the value of vaccination in the prevention of smallpox is particularly full and convincing.

The writer approves the practice of generally keeping schools open during an epidemic. It is to be regretted that he alludes to the burning of sulphur and the spraying of disinfectants as approved methods of disinfection.

The volume concludes with chapters on physical and mental growth and one on adolescence or puberty.

The text is interspersed with many excellent charts and a limited number of less interesting illustrations.

References to the literature appear at the bottom of the page and at the end of each chapter. The reviewer knows of no one book which covers so many aspects of child hygiene so thoroughly. It will be particularly valuable to teachers, physicians and advanced students who desire ready access to the important facts pertaining to this rapidly growing subject.

J. H. M. K., Jr.

Atlas der Blutkrankheiten. By Dr. Karl Schleip und Dr. Albert Adler. 2te Aufl. Pp. 174. M. 62. (*Urban u. Schwarzenberg, Berlin u. Wien, 1928.*)

The authors purpose to give illustrations of the most common and important diagnostic features of the diseases of the blood. They do not intend this book to be a text on hematology. The drawings and plates are very beautiful and were done by Schilling. They represent the blood cells in fresh preparations and as stained by the May-Gruenwald-Giemsa method.

The writers adhere to the accepted theory of the development of the blood cells.

Of the few plates of fresh blood preparations, the one showing a neutrophilic leucocytosis is rather inaccurate, the one representing the blood picture in a case of pernicious anaemia is somewhat misleading, and the plate purposing to show the cells in the fresh blood preparation of a chronic lymphocytic leukaemia is decidedly poor. The lymphocytes, as well as the one granulocyte shown, are presented with intensely blue nuclei. The crenation and intracellular degeneration of the red blood cells is very well illustrated in another drawing of a fresh blood preparation.

The colored plates are all excellent; they bring out the granulation of the various

types of leucocytes, but in many instances the nuclear structures are not drawn very distinctly. The plates of the chronic myeloid leukaemias are especially good. The Atlas contains a few pictures of endotheliocytes, another showing a trypanosome in the blood, and some very good plates of tertian malaria parasites in the fresh and in the stained blood. The plates illustrating large lymphocytes and plasma cells are misplaced, *i.e.*, plate No. 17 should be No. 18 and vice versa.

The book is very stimulating and as a Hematological Atlas should prove of great aid, especially if one remembers the immense value of such illustrations and plates—and these are very fine—in the study of blood in which the identification of the cells is especially difficult.

O. H. v. P.

Diseases of Children. By HENRY DWIGHT CHAPIN and LAWRENCE THOMAS ROYSTER. 6th Ed., 675 pp. $7.50. (*William Wood & Company, New York, 1928.*)

This book carries out the aim of the authors to present the subject of pediatrics in a compact form so that the student and practitioner can get the information with a minimal amount of reading. It should especially appeal to the general practitioner who wishes to refresh his mind on the essential and characteristic features of disease in children. This edition is thoroughly revised and brought up to date as is demonstrated by the chapter on tularemia and the one on the ketogenic treatment of epilepsy. The authors have confined themselves to the clinical side of pediatrics, while the bio-chemical phase, which is beginning to play a prominent rôle in some clinics, is but lightly touched upon. The conventional treatments are usually prescribed with enough detail for practical purposes.

The book begins with the care of the normal new-born infant, followed by a description of birth injuries and abnormalities. Then comes a comprehensive chapter on development, with convenient tables for comparisons. The chapter on the examination and signs of illness in the sick child are to the point. Under General Therapeutics is included a table of average dosages for different ages. Infant feeding is taken up in the next section, from the special care of premature infants, breast feeding, artificial feeding which is described in detail, to outlined diets for older children. The rest of the book deals with diseases of the different systems, ending up with a brief description of the commoner surgical diseases, diseases of the ear and eye, and diseases of the skin.

The book is well printed and the illustrations are helpful.

J. A. M.

Practical Surgery of the Abdomen. By GEORGE H. JUILLY. 2 vols. 1275 pp. $16.00. (F. A. Davis Company, Philadelphia, 1928.)

On opening this set, one is prejudiced against it at the outset by the fact that the author's photograph appears as the frontispiece. There is something that smacks of quackery in this sort of thing. It just isn't done in the best of circles. It is surprising that publishers of such high standing would have consented to it.

One is further prejudiced against the work at the start by the author's insistence, in his preface, that his book is a "*practical*" book. (The italics are the author's.) This word has been applied so frequently by superficial people to unscientific methods and procedures in medicine that it has come to have considerable odium attached to it. A "*practical*" method has almost come to connote the antithesis of a scientific one.

The author is unduly insistent upon a preoperative diagnosis in abdominal surgery. It is well known how often this is impossible, even with the most experienced surgeon, although the fact that an operation is imperative to relieve some unknown condition is evident to the merest novice. This situation, however, is relieved by the author's further insistence that no surgeon is competent to open the abdomen, even for a seemingly trifling condition, unless he is capable of properly performing some of the most difficult abdominal operations.

The work abounds in dogmatic statements, such as "later on in life, all appendices should be removed in cholecystectomies." This is readily understood if one considers that the work is essentially a record of the personal experiences, methods and opinions of a particular surgeon, rather than a textbook of abdominal surgery. For this reason certain notable omissions are observed throughout the two volumes. For instance, in the section on hernia Gallie's method of repairing difficult hernias with fascia strips is neglected. In the bladder section no mention is made of the elusive ulcer of Hunner. Suprapubic prostatectomy is the only method of prostatectomy considered. Cholecystography is barely mentioned.

In spite of these drawbacks, as an operative surgery the work certainly has its merit. The operations chosen by the author as those of choice for the various conditions treated are well described and abundantly illustrated with very helpful sketches.

A. R. K.

Pediatrics. By Various Authors. Edited by Isaac A. Abt, M.D. Volume VIII, Philadelphia and London, W. B. Saunders Company.

This final volume of Abt's system of pediatrics contains sections on diseases of the skin, of the ear and eye, on hospitals for infants and children, on medico-legal matters, on tumors of infancy and childhood, encephalitis, and animal parasites,—a peculiar order of arrangement which doubtless bespeaks the agonal struggles of the over-worked editor of a compendium. As in many of the other volumes, there is considerable inequality in the calibre of the material. Ward's section on animal parasites is particularly commendable for his complete and scholarly presentation.

In view of the rapid development of improvements in hospital construction and technical organization, it is difficult to see how an article in this field can long ward off the fate of obsolescence. Floor plans which were up-to-date a year ago may be of only historical interest today To those familiar with the present utilization of

space in Harriet Lane Home, the architects' original sketches as reproduced on pages 434 to 436 exemplify the mutability of administrative requirements.

R. M.

Recent Advances in Physiology. By C. LOVATT EVANS, D.Sc., F.R.S. 3rd ed. 403 pp. (*P. Blakiston's Son & Co., Philadelphia, 1928.*)

This new edition of a well known volume has been revised and two new chapters ("Excitability and Chronaxie" and "The Nervous Impulse") have been added. In these chapters the author presents the investigations advanced chiefly by the Lapicques in France, Adrian in England, Kato in Japan, and by Davis, Gasser and their coworkers, in this country. The book is very well written and should serve the physiologist as a review to fields other than his own intimate interests, and the student in general as an introduction to the more advanced aspects of certain physiological problems. The title of the book is misleading, for the wide scope of physiology makes impossible a comprehensive survey of advances in all its fields. The author has employed his best energies in treating advances in those branches of physiology devoted to the study of muscular and nervous tissues. Advances in many other fields are either dealt with briefly or omitted. This criticism should not, however, detract greatly from the book's value and it can be heartily recommended to the reader.

A. G.

Goiter Prevention and Thyroid Protection. By ISRAEL BRAM, M.D. 301 pp. $3.50. (*F. A. Davis Company, Philadelphia, 1928.*)

This book is adequately described by the paragraph in the editor's preface which says "In my many years of exclusive work in this field, I feel that the thyroid gland is more sinned against than sinning. There need be little disturbance of this vital organ if certain simple rules of physical and mental conduct were observed. Such information as would help to prevent potential and overcome actual structural and functional disorders of the thyroid gland is offered in the forthcoming pages. Since in past years I have written solely for the medical profession, it is my intention that this volume be useful and interesting to the non-medical as well as the medical individual. In the presence of an actual thyroid disturbance both doctor and patient will here find helpful suggestions calculated to create the co-operative spirit so vital to prompt recovery."

It would seem probable that the advice in the ensuing pages will prove of more interest to the non-medical than to the medical individual, but the reviewer may be wrong in his opinion of what interests non-medical individuals.

H. M. T., JR.

An Introduction to Experimental Pharmacology. By TORALD SOLLMANN, M.D., and PAUL J. HANZLIK, M.D. Illustrated. 321 pp. $4.25. (*W. B. Saunders Company, 1928.*)

As the authors point out in their preface, the book is an "adaptation of Sollmann's 'Laboratory Guide in Pharmacology' to a more definite course of exercises,

involving a simplification of arrangement, a reduction in the number of experiments, and an expansion of the explanatory discussions, especially in the exercises on animals."

The present volume possesses decided advantages over its predecessor while still preserving all its good points. It will be found useful not only to students and workers in pharmacology, but also to others who in their researches may need at times to use pharmacological technique and drugs.

The material in the several appendices, especially the dosages for animals, is very valuable. No doubt, each teacher of pharmacology will have to make his own selection and arrangement of the laboratory experiments to be presented to his class, and for this he will find this volume very helpful. Undoubtedly, the authors have given us a welcome addition to the literature of pharmacology.

E. M. K. G.

Neurological Examination. An Exposition of Tests with Interpretation of Signs and Symptoms. By CHARLES A. MCKENDREE, A.B., M.D. With a Foreword by Henry Alsop Riley, A.M., M.D. Illustrated. 262 pp. $3.25. (*W. B. Saunders Company, Philadelphia, 1928.*)

This little book is intended for medical students who are beginning the study of neurology and represents an exposition of the methods in use at Columbia University. It is meant to be used in connection with Wechsler's textbook of neurology. There are sections on history taking, on testing muscular strength, coordination, sensibility, reflexes and the cranial nerves. Short chapters deal with the neurological importance of disease of the cardio-respiratory system, the skeletal and other systems. The mental status is covered briefly and some mention is made of the most important laboratory tests. There is an index.

Dr. McKendree has covered the ground clearly and fully. The tests are interpreted as well as described. The value of the book to students would be greatly increased, however, by some directions about the actual performance of a routine neurological examination, and distinction should be made between the important tests which should be done every time and those which should be reserved for special indications. Without this help the beginner may soon be lost in the details and fail to grasp the essentials.

F. R. F.

Modern Problems in Neurology. By S. A. KINNIER WILSON, M.D., B.Sc. (Edin.), F.R.C.P. 358 pp. $6.00. (*William Wood & Company, New York, 1929.*)

This volume includes the Croonian lectures of 1925, the Harveian lecture of 1926 and others delivered before the Congress of the American Medical Association and at the joint meeting of the American Medical Association and the Royal Society of Medicine in London, 1927. These have been revised and some new matter added. The subjects discussed include the epilepsies, epileptic variants, narcolepsy, pathological laughter and crying, dysesthesias and their neural cor-

relates, the Argyll-Robertson pupil and several lectures dealing with disorders of motility with especial reference to striatal disease. The author has long occupied a commanding place among British neurologists and these papers represent the mature fruit of his large experience and analytical mind. Each lecture deals with a number of complex and unsolved problems which are under investigation at the present time and are therefore of especial interest at this moment. The Croonian lectures are, perhaps, the most interesting. They are devoted to an exhaustive analysis of the clinical features of striatal disease and are of much value, especially in the rejection of many vague functions which have been attributed to the basal ganglia. The author believes that choreo-athetosis is due to a succession of complex cortical reflexes released by lesions involving the "cerebello-mesencephalo-thalamo-cortical apparatus," and presents numerous arguments to support this theory. Some very damaging criticism has been advanced against this doctrine since it was first presented and it is certainly open to grave objections. The other papers are all of great importance and should be read by every neurologist.

By way of criticism it may be said that the author's method of approach is logical rather than physiological and too much attention is given to definition of words and mere terminology. It must be admitted that he seems to lack that insight into physiological processes which is so brilliantly exemplified in some of the younger British neurologists.

F. R. F.

Clinical Examination of the Nervous System. By G. H. MONRAD-KROHN, M.D., F.R.C.P. With a foreword by T. Grainger Stewart, M.D., F.R.C.P. Fourth Edition. 209 pp. $2.50. (*Paul B. Hoeber, Inc., New York, 1928.*)

This is an excellent little book which gives in compact form the routine method of clinical examination which the distinguished author has adopted in his neurological clinic. The work is clearly the outgrowth of the author's broad experience and bears the stamp of his individuality. The general treatment is along broad lines, but practical and important points are strongly emphasized. The book can be very warmly recommended to all beginners in neurology and will undoubtedly have a long period of usefulness.

F. R. F.

BOOKS RECEIVED

An Introduction to the History of Medicine. With Medical Chronology, Suggestion for Study and Bibliographic Data. By FIELDING H. GARRISON, A.B., M.D. Fourth edition, revised and enlarged. 1929. 8°. 996 pages. W. B. Saunders Company, Philadelphia. $12.00.

The Story of Modern Preventive Medicine. Being a Continuation of the Evolution of Preventive Medicine. 1927. By SIR ARTHUR NEWSHOLME, K.C.B., M.D., F.R.C.P. 1929. 12°. 295 pages. The Williams & Wilkins Company, Baltimore. $3.00.

Modern Problems in Neurology. By S. A. KINNIER WILSON, M.D., B.Sc. (Edin.) F.R.C.P. 1929. 8°. 364 pages. William Wood & Company, New York, $6.00.

The Care of the Child. By ALTON GOLDBLOOM, B.A., M.D., 1928. 12°. 240 pages. Longmans, Green and Company, New York. $1.50.

Erythema Nodosum. By J. ODERT SYMES, M.D. 1928. 12°. 72 pages. William Wood & Company, New York. $2.00.

A Text-Book of Actinotherapy. With Special Reference to Ultra-Violet Radiation. For Practitioners and Students. By D. D. ROSEWARNE, M.R.C.S. (Eng.) L.R.C.P. (Lond.). With twenty illustrations, including a coloured plate. 1928. 8°. 237 pages. C. V. Mosby Company, St. Louis. $4.00.

Text-Book of Clinical Neurology. For Practitioners and Students. By M. NEUSTAEDER, M.D., Ph.D. With an introduction by Edward D. Fisher, M.D. 1929. With 228 illustrations, some in colors. 8°. 602 pages. F. A. Davis Company, Philadelphia. $6.00.

Text-Book of Urology. For students and practitioners. By DANIEL N. EISENDRATH, M.D. and HARRY C. ROLNICK, M.D. 1928. 700 black and white illustrations and 11 in color. 8°. 942 pages. J. B. Lippincott Company, Philadelphia. $9.00.

A History of Pathology. By ESMOND R. LONG, Ph.D., M.D. 1928. 8°. 291 pages. The Williams & Wilkins Company, Baltimore. $5.00.

Spasmophilia. By EDWARD C. WRIGHTSMAN, M.D. 1928. 8°. 155 pages. Richard G. Badber, Boston.

The Respiratory Function of the Blood. Part II. Haemoglobin. By JOSEPH BARCROFT. 1928. 8°. 200 pages. Cambridge University Press, London. 12/6.

Urology. By EDWARD L. KEYES, M.D., Ph.D., F.A.C.S. With one hundred and eighty-four illustrations in the text and twenty plates, two of which are in color. 1928. 8°. 763 pages. D. Appleton and Company, New York.

Atlas der Blutkrankheiten. Von DR. KARL SCHLEIP und DR. ALBERT ALDER. Zweite, völlig neu bearbeitete Auflage. Mit 108 farbigen Bildern. 1928. 8°. 174 Seiten. Urban u. Schwarzenberg, Berlin u. Wien. M. 62.

Handbuch der biologischen Arbeitsmethoden. Unter Mitarbeit von über 700 bedeutenden Fachmännern herausgegeben von Geh. Med.-Rat Prof. Dr. Emil Abderhalden. Abt. IV, Angewandte chemische und physikalische Methoden, Teil 6, 2. Hälfte, Heft 3. Methoden zum Studium der Wirkung der einzelnen Verdauungssäfte. Von GERTRUD WOKER. 1928. 8°. 1215–1706 Seiten. Urban u. Schwarzenberg, Berlin u. Wien. M. 24.

A Text-Book of Pathology. By W. G. MACCALLUM. Fourth edition, thoroughly revised. 1928. 8°. 1177 pages. W. B. Saunders Company, Philadelphia. $10.00.

Les Actualités Physiothérapiques. 1. Electrothérapie. 3. l'Electro-diagnostic, par P. DUHEM. Préface de M. le Dr. A. Souques. 1928. Tableaux des points moteurs. Gauthier-Villars et Cie., Paris.

Les Actualités Physiothérapiques. Actinothérapie IV. Les rayons ultraviolets, par E. et H. BIANCANI. 1928. 12°. 217 pages. Gauthier-Villars et Cie, Paris.

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